

Commissioner for Patents
Page 2

Serial No.: 09/722,339

REMARKS/ARGUMENTS

Allowable Subject Matter

Applicant gratefully acknowledges the Examiner's indication that claims 3-12, 15-24, 27-36, 39-43 and 45-49 would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims and further provided that the double patenting rejection is addressed.

Double Patenting

The Office Action has provisionally rejected claims 1-49 under the judicially created doctrine of obviousness-type double patenting in view of claims 1-88 of copending application 09/789,559 (Roberts et al.) entitled "Aharmonic Interleaving of Forward Error Corrected Signals" (hereinafter "Roberts"). Firstly, Applicant notes that of the original set of 88 claims, claims 1, 14, 27, 39, 51 and 70 have been amended and claims 7, 20, 33, 45, 57 and 76 have been cancelled. With respect to claims 1-6, 8-19, 21-32, 34-44, 46-56, 58-75 and 77-88, Applicant respectfully requests reconsideration of the provisional double patenting rejection for the following reasons.

As described in the present application, (see e.g. p. 4, lines 12 to 16) there is provided a method and apparatus for conveying data signals through a multi-channel WDM network in which the effects of performance variations across the channels are effectively compensated.

Claims are directed to a method and apparatus, e.g. as recited for example in claim 1, providing equalization across N (an integer, $N > 1$) channels of a multi-channel link of a communications network, comprising steps of:

BEST AVAILABLE COPY

Commissioner for Patents
Page 3

Serial No.: 09/722,339

- a) **distributing each one of N (an integer, $M > 1$) data signals across the N channels of the link, such that a substantially equal proportion of each data signal is conveyed through each one of the N channels as a composite data-stream; and**
- b) **processing the composite data-streams conveyed through the N channels to recover the N data signals;**
- whereby performance variations between the N channels are equalized by averaging within each of the N data signals.**

This method therefore provides for optical equalization across N (an integer, $N > 1$) channels of a multi-channel link of a communications network, by averaging effects of optical performance variations within each of the N (an integer, $M > 1$) parallel data signals. At a transmitting end node of the link, each one of the M data signals are distributed across the N channels of the link. Thus a substantially equal portion of each data signal is conveyed through the link in each one of the N channels. At a receiving end node of the link, respective bit-streams received over the N channels are processed to recover the N data signals. As a result, bit error rates of the bit-streams received through each channel are averaged across the M data signals, all of which therefore have a substantially equal aggregate bit error rate.

For example, a sub-stream processor and a sequential interleaving multiplexor are used to interleave sub-stream data, as described in the specification on page 11, lines 6-15, with reference to figure 2. The sub-stream processor receives data units of a sub-stream from a signal divider and inserts a unique sub-stream identifier into each of the received sub-streams. The sequential interleaving multiplexor then operates to interleave the sub-streams into a single channel. Thus, the interleaver, through the unique sub-stream identifier, provides a means of successful discrimination and separation of the sub-streams from a respective channel.

Commissioner for Patents
Page 4

Serial No.: 09/722,339

As such, the Applicant notes that the interleaving mechanism in the present invention does not require that the sub-stream data be sorted according to a pre-determined sort order prior to their being interleaved.

Referring now to Roberts which relates to anharmonic interleaving of data streams, one aspect of the Roberts invention provides a method of interleaving a plurality of sub-streams into a high-speed data signal. Successive blocks of data from each sub-stream are interleaved into the high-speed data signal using a predetermined interleaving pattern that is different for two consecutive sequences of N (an integer > 2) blocks of data within the high-speed data signal. Also claimed are an anharmonic interleaver, and recovery of a plurality of anharmonically interleaved substreams and an anharmonic de-interleaver.

In particular, the Applicant respectfully submits that the interleaver described and claimed in Roberts sorts the sub-stream data in a pre-determined order prior to their being interleaved. For example, the interleaver in Roberts, which may comprise parallel inverse multiplexors, channels and a signal multiplexor, is structurally different from that of the present invention. The Roberts specification on paragraphs 43 and 44 illustrates that the parallel inverse multiplexors first operate to forward successive blocks of a respective sub-stream to one of N channels, where N is greater than 2. Within each channel, data blocks received from the inverse multiplexers are arranged in accordance with a predetermined sort order and supplied to a respective input of a signal multiplexer. The signal multiplexor then operates to sequentially interleave blocks from the channel into the high speed data signal. Thus, the interleaver in Roberts, through the usage of pre-determined sort orders in each of the N channels provides for successful interleaving, and subsequent de-interleaving, for discrimination and separation of the sub-streams from the respective high speed data signal.

In contrast, unique sub-stream identifiers, as previously mentioned, are used in the present invention to provide an alternative and different means of successful

BEST AVAILABLE COPY

Commissioner for Patents
Page 5

Serial No.: 09/722,339

discrimination and separation of the sub-streams from an interleaved signal for a different purpose and to address a different problem.

Therefore, it is submitted that the claims on file are patentably distinct from Roberts, and not obvious in view of Roberts. The solution of Roberts would not address the problem solved by the present invention. Accordingly, withdrawal of the provisional obviousness-type double patenting rejection is requested.

Claim Rejections – 35 USC 102

The Office Action has rejected claims 1, 13, 25, 37 and 44 under 35 USC 102(b) as being anticipated by Sharony (U.S. Patent 5,953,143). The Office Action states that Sharony teaches the distribution of M data signals over N channels by virtue of Figure 1 which shows n input fibers 11 connected to a 1xn optical splitter 12. With respect, the n input fibers are not the equivalent of data signals since each of the n input fibers carries a plurality of wavelength channels, each with its own data signal. Sharony states that "on each fiber 11 there are m wavelength transmitter nodes, each node characterized by a tunable transmitter 17." Simply put, the fibers 11 are not the same as the data signals mentioned in the application. Furthermore, the 1xn optical splitter merely "splits the optical energy between the n fibers 13". As is well known in the art, a 1xn optical splitter merely splits the light in the fiber into n identical signals. The 1xn optical splitter therefore has no ability to distribute portions of each data signal over different channels, as is claimed in the present application. Moreover, Sharony fails to disclose the further limitation that this distribution of M data signals over N channels results in substantially equal proportions of each data signal being conveyed over each channel. Therefore, for all of these reasons, it is respectfully submitted that claims 1, 13, 25, 37 and 44 are novel with respect to Sharony.

Claim Rejections – 35 USC 103

The Office Action has rejected claims 2, 14, 26 and 38 under 35 USC 103(a) as being obvious in view of Sharony (U.S. Patent 5,953,143) and Marko

Commissioner for Patents
Page 6

Serial No.: 09/722,339

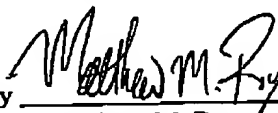
(U.S. Patent 6,229,824). These claim rejections are predicated on the assumption that Sharony teaches all of the limitations of the independent claims from which these claims depend. In light of the foregoing arguments demonstrating that the independent claims are patentable, it is therefore respectfully submitted that these dependent claims are also allowable.

Concluding Remarks

In light of the foregoing arguments, it is respectfully submitted that the claims are now in a condition for immediate allowance. Applicants therefore respectfully solicit the prompt issuance of a Notice of Allowance.

Respectfully submitted,

ROLAND A. SMITH et al.

By 
Matthew M. Roy
Registration No. 48,074
Attorney for Applicants

MMR/sw

Address:
OGILVY RENAULT
1981 McGill College Avenue, Suite 1600
Montreal, Quebec, Canada H3A 2Y3
Tel. (613) 780-8659